How Tessellating!

Key Concept

Repeating patterns, or tessellations, of atoms that have no gaps or overlaps form crystals.

Skills Focus

observing, classifying, making models, forming operational definitions

Time

50 minutes

Materials

index cards
tape
scissors
plain white paper
colored pencils
ruler

Advance Preparation

Gather several small mirrors for More to Explore. Mirrors should be unframed and have edges that aren't sharp.

Teaching Tips

- Be sure that students don't choose final patterns that are too simple. Encourage students to use rectangles and triangles only until they understand how to tessellate patterns.
- When students tape smaller peices of paper together to make a shape, the tape should not extend over the edge of the pieces and affect the tessellation by causeing overlap of the patterns.
- Have more index cards available for studdents if they need them.
- Tessellation models are not complete models of three-dimensional crystal shapes. After the activity, have students use identical three-dimensional shapes to model actual crystal structure. Another option is to show students pieces of rock salt, which are cubic crystals. Carefully break the rock salt into smaller pieces of salt with a hand lens and observe that the salt crystals remain cubic.

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How Tessellating!

Pre-Lab Discussion

A floor covered with tiles may be made of repeated squares. A honeycomb is made of repeated hexagons. Crystal shapes within a mineral have definite repeating patterns, too. A pattern tessellates if it repeats and covers a plane (such as a sheet of paper, a floor, or a wall) with no gaps or overlaps. See Figure 1. In this investigation, you will model crystal shapes by creating patterns that tessellate.

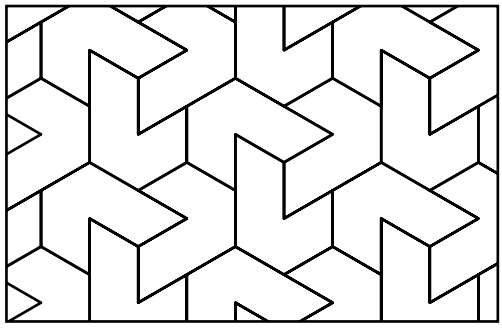

Figure 1

Sample Tessellation

1. Think about what makes up a mineral. Why isn't coal a mineral?

_____

_____

2. How many sides does a hexagonal figure have?

_____

_____

Problem

What patterns tessellate?

Materials *(per group)*

- index cards
- tape
- scissors
- plain white paper
- colored pencils
- ruler

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Safety *Review the safety guidelines in Appendix A.*

Use caution in handling sharp scissors.

Procedure

1. Use a ruler and scissors to carefully cut simple geometric shapes with straight edges from an index card. Begin with squares, rectangles, or hexagons. The simpler the shape, the easier it will be to get it to tessellate.
2. Tape the pieces of the card together to form an interesting new shape that you think will tessellate. Remember, if you make your shape very complicated, you will have trouble getting it to repeat.
3. Trace your new shape repeatedly onto a piece of paper. Does the shape tessellate? Sketch it in the appropriate space in the Observations section below. If it doesn't tessellate, try taping the pieces in a different arrangement or make a different pattern. Sketch shapes that do not tessellate in the appropriate space below.
4. Once you get a shape to tessellate, cover the entire area in the Observations section on the next page with your design.
5. Look for other patterns that tessellate in your design. Can you find any? Use colored pencils to outline several different shapes that tessellate.

Observations

Patterns That Tessellate	Patterns That Don't Tessellate

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How Tessellating! *(continued)*

Tessellation	Sample Tessellation

Analyze and Conclude

1. Did your first pattern tessellate? With what basic geometric shape did you begin?

_____

2. Could you use a circle or an oval to tessellate? Give a reason for your answer.

_____

_____

3. A mineral has a definite crystal shape, as shown in your textbook. Which crystal shapes tessellate? Are any of the shapes the same as the ones that tessellated for you?

_____

_____

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Critical Thinking and Applications

1. How is your tessellating pattern like a crystal's shape?

_____

_____

_____

2. List examples of tessellating patterns in your everyday life.

_____

_____

3. How does your model of tessellating patterns differ from actual crystal shapes?

_____

_____

More to Explore

The crystals found within all minerals form tessellating patterns. Almost all of these patterns have another interesting property—symmetry. A pattern has symmetry if it looks exactly the same on either side of a center line through the pattern.

New Problem How can you determine whether your pattern has symmetry?

Possible Materials Use your tessellating pattern from the previous activity. Think of how you could use a mirror to find out if your pattern tessellates.

Safety Use caution in handling any sharp items or items that could break.

Procedure Write a procedure you would follow to answer the question. Have the teacher approve your procedure before you carry out the investigation.

Observations Make a drawing of your shape that shows how the pattern does or does not have symmetry.

Analyze and Conclude

1. Does your shape have symmetry? How do you know?

_____

2. What are some examples of symmetry in nature?

_____

_____

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